

**DETAILED ACTION**

1. Claims 1-9 and 11-20 are pending as amended on 21 July 2009 and claim 10 is cancelled.
2. The text of those sections of Title 35, US Code not included in this action can be found in a prior Office Action.

***Response to Amendment and Arguments***

3. Applicant's amendment to claims 2 and 4-20, filed 21 July 2009, specifically correcting the informalities has been fully considered and overcome the following:

The objection to claims 2 and 4-20 has been withdrawn.

4. Applicant's amendment to independent claim 1, filed 21 July 2009, specifically adding the limitation "the earth pressure balance tunnel boring machine" has been fully considered and overcomes the following:

The rejection of 1-4, 7, 9, 12 and 15 under 35 U.S.C. 102(b) as being anticipated by US Patent 4,442,018 (Rand hereinafter) has been withdrawn.

The rejection of claims 1-4, 7, 9, 12 and 15-20 under 35 USC 103(a) as being unpatentable over Rand has been withdrawn.

5. Applicant's importation of the limitation of claims 10 into independent claim 3 and cancellation of claim 10 and Applicant's argument that Rand, US Patent 3,215,200

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(Kirkpatrick hereinafter), or any combination do not teach or suggest either the use of an earth pressure balance tunnel boring machine or an acrylic acid-based polymer having a molecular weight of 2,000 to 20,000 have been fully considered and overcomes the following:

The rejection of claims 1-9, 12 and 15 under 35 USC 103(a) as being unpatentable over Rand in view of Kirkpatrick has been withdrawn.

The rejection of claims 1-4, 7 and 9-15 under 35 USC 103(a) as being unpatentable over Rand in view of US Patent 4,013,568 (Fischer hereinafter) has been withdrawn.

***Claim Rejections - 35 USC § 103***

6. Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6,287,052 (Basset hereinafter) in view of US Patent 4,013,568 (Fischer hereinafter).

Basset teaches a method of boring a tunnel with an earth-pressure tunnel boring machine comprising injecting into the formation to be bored just before the cutting tools of the boring machine an aqueous foam containing at least one surfactant and at least one gas (Abstract). The foam composition is injected in the form of foam formed either upstream of the head of the boring machine, or in situ (column 2, lines 17-19).

Basset does not disclose expressly that the aqueous composition further comprise a water-soluble acrylic acid-based polymer.

Fischer teaches a composition and method for drilling a well into a subterranean formation containing a geothermal fluid utilizing a gas-containing aqueous drilling fluid containing a salt of a high molecular weight acrylic polymer (Abstract). In order to increase both the viscosity and the cuttings-carrying ability of the gas-containing drilling fluid, there is added an alkali metal or ammonium salt of a polymer of acrylic acid, referred to as ammonium and alkali metal polyacrylates. (column 5, lines 53-57). Fischer further discloses the polymers have an average molecular weight in excess of about 2,000 and are low enough so that their ammonium and/or alkali metal salts are dispersible in aqueous media. In general, it is desirable to use those polymers whose average molecular weight is in the range of 5,000 to 50,000. The salt of the polymer may be of any alkali metal such as sodium and potassium (column 5, lines 60-68).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art utilize Fischer's salts of polyacrylic acid in the aqueous foam composition of Basset. The rationale to do so would have been the motivation provided by the teaching of Fischer that to do so would reduce the damage to the formation due to the invasion of drilling fluid into the formation surrounding the well (column 2, lines 16-19).

7. Claims 3-7 and 11-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Basset in view of Fischer as applied to claims 1 and 2 described above in further view of US Patent 5,513,712 (Sydansk hereinafter).

Basset and Fischer combine to teach a method of boring a tunnel with an earth-pressure tunnel boring machine comprising injecting into the formation to be bored just

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before the cutting tools of the boring machine an aqueous foam containing at least a surfactant and a salt of polyacrylic acid.

Neither Basset nor Fischer discloses expressly the surfactant further comprises sulphate esters, sulphate ethers or sulphonates.

Sydansk teaches a process employing a polymer enhanced foam in a wellbore drilling operation. The polymer enhanced foam is formed from an acrylamide polymer, a surfactant, an aqueous solvent, and an added gas (Abstract). Sydansk further teaches the surfactant may be substantially any conventional anionic, cationic or nonionic surfactant which is distributed throughout the liquid medium to stabilize the interfaces between the liquid and gas phases. Specific surfactants having utility include ethoxylated sulfates, ethoxylated alcohols, petroleum sulfonates, and alpha olefin sulfonates (column 5, line 60 – column 6, line 3).

### ***Allowable Subject Matter***

8. Claims 8, 9 and 15-20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Basset, Fischer and Sydansk, the closest prior arts, teach earth pressure balance tunnel boring machine comprising foamed surfactant solution and acrylic based polymer but fails to disclose the injection rates of the surfactant and the acrylic polymer.

***Conclusion***

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ATNAF ADMASU whose telephone number is (571)270-5465. The examiner can normally be reached on M-F 8:00-5:30, Flexible Schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Pyon can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/ASA/

/Timothy J. Kugel/  
Primary Examiner, Art Unit 1796